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Preliminary Studies on the Physico-Chemical Characteristics of Perennial Freshwater Lake of Warangal District, Telangana State, India

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Abstract: ***An investigation has been carried on the physic-chemical parameters of wardhannapet cheruvu in Warangal District, Telangana state for the period from June 2019 to May 2020. Water samples were collected from the lake and analyzed using standard laboratory methods and procedures. The parameters that were studied included Water Temperature(TEM), Total Dissolved Solids(TDS), Water Transparency(WRS), PH, Dissolved Oxygen(DO), Biological Oxygen Demand(BOD), Free Carbon di Oxide(Co_2), Total Alkalinity(TA), Chlorides(CL), Phosphate(PO_4), Sulphate(SO_4)Nitrate(NO_3), Ammonia(NH_3) and Electrical Conductivity(EC).Water temperature ranged from 24.00°C to 31.50°C,Total Dissolved Solids from 36.10 to 48.20 (mg/l),Transparency ranged from 44.20 to 57.00(Cm);pH from 6.52 to 7.70; Dissolved Oxygen from 7.5 to 8.9 (mg/l);Biological Oxygen Demand from 4.1 to 7.5(mg/l); free CO_2 from 1.70 to 2.20(mg/l); Total Alkalinity from 38.00 to 56.30(mg/l);Chloride from 37.00 to 50.00(mg/l);Phosphate(PO_4) from 1.70 to 2.15(mg/l);Sulphate(SO_4) from 30.30 to 47.00(mg/l);Nitrate from 0.30 to 0.65(mg/l);Ammonia from 0.72 to 1.53(ppm) and Electrical Conductivity from 11.25 to 131.40(µmchos/cm).In the present study the waters of wardhannapet cheruvu revealed that the seasonal changes of the water quality parameters were within the permissible limits. It is however concluded that above results reveals that the selected lake is suitable for fish culture and even agriculture practices too.***

Keywords: Wardhannapet fresh water lake, physico – chemical parameters.

I. INTRODUCTION

Water is one of the most valuable resources on planet earth and is the lifeline of almost all living creatures on earth. Water resources are of critical importance to both natural ecosystem and human development. It is vital factor of life and it is considered as precious compound on the earth. Water occupied 71% of our earth's surface, in this97% of water available as in the form saline water in oceans and 3% fresh water in form of polar ice caps, surface and ground water resources. The natural aquatic resources like rivers, ponds, streams and lakes are causing heavy and varied pollution in environment leading to changes in water quality and depletion of aquatic biota. Due to increased pollution, urbanization rapid growth of industrialization and disposal of sewage, domestic waste, industrial effluents and other human being activities. The quality of water effects the species composition, abundance, productivity and physiological conditions especially, the indigenous population of aquatic organisms [30].The alteration in physico–chemical parameters leading to eutrophication has became widely recognized problem of water quality deterioration.

II. MATERIALS AND METHODS

Present study carried out in fresh water lake, Wardhannapet cheruvu located at wardhannapet village, Warangal district. The physico-chemical characteristics of water including Water Temperature, Total Dissolved Solids, Water Transparency, PH, Dissolved Oxygen, Biological Oxygen Demand, Free Carbon di Oxide, Total Alkalinity, Chlorides, Phosphate, Sulphate, Nitrate, Ammonia and Electrical Conductivity were determined by [1],[26].(Table-1).

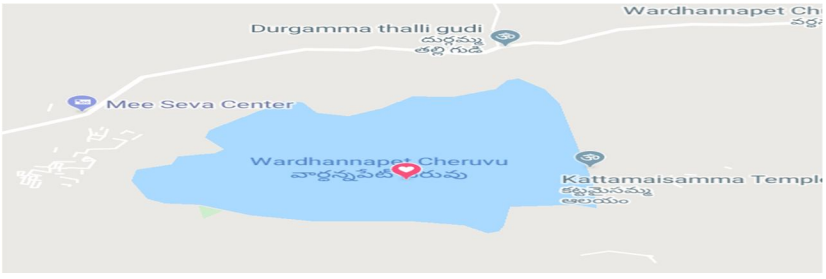

Fig-1: Location of Wardhannapet

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III. RESULTS AND DISCUSSION

A. Temperature

These physic-chemical parameters of water however have tremendous influence on fish culture if not agriculture practices. Because these factors certainly, have influence on fish and other aquatic organisms. Water temperature, an important parameter which influences the onset of fish spawn, growth of aquatic vegetation growth and the biological demand of the lake water. As water temperature increases, it holds less oxygen. The plants and animals also use more oxygen due to increase of respiration rate. These factors result in less availability of oxygen for fish in water. The water temperature observed in this study is considered as normal temperature for aquatic life especially in the Indian region. Which is considered as the characteristic feature of medium humid climate [13].The water temperature ranged from 24.00°C to 31.50°C.The highest temperature was recorded in the month of May 31.50°C,while the lowest temperature was recorded in the month of December 24.00°C.During the summer season high water temperature, where as low temperature in winter season [29],[11],[21],[5],[22].According to Reid(1961) Total Dissolved Solids will be playing an important role for the productivity of the aquatic environment. The Total Dissolved Solids value ranges from 36.10 to 48.20 (mg/l).The highest Total Dissolved Solids value was recorded in the month of June (48.20 mg/l)), while the lowest Total Dissolved Solids value was recorded in the month of January (36.10mg/l).During the monsoon season high Total Dissolved Solids, where as low Total Dissolved Solids in winter season [10].

Water transparency depends on the amount of particles in the water. Particles can be inorganic (e.g.sediment from erosion) or organic (such as algae, phytoplankton).Transparency of water related to the depth that light will penetrate water. The transmission of light in to body of water is extremely important since the Sun is the primary source of energy for all biological phenomena. The water transparency value ranges from 44.20 to 57.00(Cm).The highest water transparency value were recorded in the month of January (57.00Cm), while the lowest water transparency value were recorded in the month of September (44.20Cm).During the winter season high Water transparency, where as low water transparency in monsoon season [3].The ph of water is a measure of the concentration of hydrogen ions [9].PH can change rapidly, which in turn may have severe effects on the aquatic biota [4].The PH value ranges from 6.52 to 7.70.The highest PH value were recorded in the month of June (7.70), while the lowest PH value were recorded in the month of February (6.52).During the monsoon season high PH, where as low PH in summer season [28], [2].Dissolved oxygen in water is necessary for respiratory metabolism of most aquatic organisms and affects the solubility and availability of many nutrients and therefore determines the productivity of aquatic ecosystems (Wetzel 2001).The Dissolved Oxygen ranges from 7.5 to 8.9 (mg/l).The highest Dissolved Oxygen value were recorded in the month of June (8.9mg/l),while the lowest Dissolved Oxygen value were recorded in the month of February (7.5mg/l).During the monsoon season high Dissolved Oxygen, where as low Dissolved Oxygen in summer season [19],[20].The Biological Oxygen Demand (BOD) is a parameter enables to determine the relative oxygen requirements especially of waste waters, polluted waters and effluents. The apical test involved measuring the requirement of oxygen needed for bio-chemical degradation of organic matter. The oxygen utilized to oxidize nitrogenous compounds may also be measured.The Biological Oxygen Demand ranges from 4.1 to 7.5(mg/l).The highest Biological Oxygen Demand value were recorded in the month of January(7.5mg/l),while the lowest Biological Oxygen Demand value were recorded in the month of February(4.1mg/l).During the winter season high Biological Oxygen Demand, where as low Biological Oxygen Demand in summer season [27], [12], [16].Carbon dioxide plays an important role in the life of micro-organisms arid plants. In the absence of free CO_2 the bicarbonates are converted into carbonates, releasing CO_2 which is utilized by autotrophs, thus making the water more alkaline (Saxena, 1987).The Carbon di Oxide During ranges from 1.70 to 2.20(mg/l).The highest Carbon di Oxide value were recorded in the month of January(2.20mg/l),while the lowest Carbon di Oxide value were recorded in the month of February (1.70mg/l).During the winter season high Carbon di Oxide, where as low Carbon di Oxide in summer season[24] [14].Alkalinity in most natural water is the function hydrolyzed in solution and produced hydroxyl ion. It is also as used as a measure of productivity [7].The Total Alkalinity ranges from 38.00 to 56.30(mg/l).The highest Total Alkalinity value were recorded in the month of September (56.30mg/l), while the lowest Total Alkalinity value were recorded in the month of February(38.00mg/l).During the monsoon season high total alkalinity, where as low total alkalinity in summer season.Chloride is one of the most important inorganic anion in water. Due to its high solubility it is present naturally in all types of water body. The main source of chloride in water is the domestic sewage discharge. The concentration of chloride in freshwater is an indicator of sewage pollution [25].The Chloride ranges from 37.00 to 50.00(mg/l).The highest Chloride value were recorded in the month of August (50.00mg/l),while the lowest Chloride value were recorded in the month of February(37.00mg/l).During the monsoon season high Chloride, where as low Chloride in summer season.Phosphate although present in very small quantity in water is important for the production of phytoplankton's, which forms food for fishes [6].The Phosphate ranges from 1.70 to 2.15(mg/l).

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The highest Phosphate value were recorded in the month of September (2.15mg/l), while the lowest Phosphate value were recorded in the month of February (1.70mg/l).During the monsoon season high Phosphate, where as low Phosphate in summer season.The Sulphate ranges from 30.30 to 47.00(mg/l).The highest Sulphate value were recorded in the month of August (47.00mg/l),while the lowest Sulphate value were recorded in the month of February (30.30mg/l).During the monsoon season high Sulphate, where as low Sulphate in summer season.The most vital nutrients in water in aquatic gadget are nitrogen (N) and phosphorous (P).These nutrients are vital to the growth of plants and animals in aquatic systems. Nitrate is the most notably oxidized from of nitrogen compounds typically found in natural water, due to the fact it is the manufactured from aerobic decomposition of organic nitrogenous matter. The Nitrate ranges from 0.30 to 0.65(mg/l).The highest Nitrate value were recorded in the month of July (0.65mg/l), lowest Nitrate value were recorded in the month of February (0.30mg/l).During the monsoon season high Nitrate, where as low Nitrate in summer season [15], [8].The occurrence of ammonia in the water source is often associated with pollution due to the sewage infiltration, use of nitrogen fertilizer or livestock wastes [17].Ammonia occurs in natural water due to ammonotelic organisms. The Ammonia ranges from 0.72 to 1.53(ppm). The highest Ammonia value were recorded in the month of October (1.53ppm),while the lowest Ammonia value were recorded in the month of February (0.72ppm).During the winter season high ammonia, where as low ammonia in summer season. Electrical Conductivity is the potential of an aqueous solution cross-electrical present, which depends on ions and their complete awareness, mobility and temperature. The Electrical Conductivity ranges from 112.25 to 131.40(µmchos/cm).The highest Electrical Conductivity value were recorded in the month of September (131.40µmchos/cm),while the lowest Electrical Conductivity value were recorded in the month of February(112.25µmchos/cm).During the monsoon season high electrical conductivity, where the low electrical conductivity in summer season.

Table-1: Showing Monthly& Seasonal Variations of Wardhannapet Fresh Water Lake 2019-2020

SEASON	MONSOON SEASON													
MONTH	TEM	TDS	TRS	PH	DO	BOD	CO_2	TA	CL	PO_4	SO_4	NO_3	NH_3	EC
Jun-19	29.50	47.50	47.00	7.70	8.9	5.1	1.82	49.50	46.10	1.80	40.20	0.55	1.10	120.00
Jul-19	29.30	48.20	46.30	7.56	8.6	6.0	1.91	51.20	48.00	1.86	42.30	0.65	1.36	123.20
Aug-19	29.00	46.70	45.00	7.45	8.7	5.5	1.95	53.20	50.00	1.93	47.00	0.60	1.40	126.50
Sep-19	28.00	44.30	44.20	7.30	8.5	5.7	1.97	56.30	47.60	2.15	45.60	0.52	1.47	131.40
MEAN	28.95	46.67	45.62	7.50	8.67	5.57	1.91	52.55	47.92	1.93	43.77	0.58	1.33	125.27
WINTER SEASON														
MONTH	TEM	TDS	TRS	PH	DO	BOD	CO_2	TA	CL	PO_4	SO_4	NO_3	NH_3	EC
Oct-19	27.60	39.00	48.30	7.00	8.2	6.2	1.99	53.10	46.00	2.05	44.70	0.50	1.53	121.33
Nov-19	27.00	38.60	50.00	7.10	8.0	6.6	2.00	48.50	45.00	2.00	43.30	0.46	1.50	119.70
Dec-19	24.00	37.40	53.40	7.15	7.9	7.0	2.10	46.30	44.20	1.85	42.75	0.41	1.46	118.50
Jan-20	26.00	36.10	57.00	7.20	7.8	7.5	2.20	44.20	43.60	1.78	42.55	0.45	1.40	117.45
MEAN	26.15	37.77	52.17	7.11	7.97	6.82	2.07	48.02	44.70	1.92	43.32	0.45	1.47	119.24
SUMMER SEASON														
MONTH	TEM	TDS	TRS	PH	DO	BOD	CO_2	TA	CL	PO_4	SO_4	NO_3	NH_3	EC
Feb-20	28.20	39.30	55.10	6.52	7.5	4.1	1.70	38.00	37.00	1.70	30.30	0.30	0.72	112.25
Mar-20	29.00	40.20	50.00	6.95	7.9	5.1	1.75	40.00	39.30	1.75	32.40	0.36	0.81	113.46
Apr-20	30.50	42.00	49.10	7.40	7.7	4.5	1.78	43.20	41.40	1.77	35.60	0.42	0.88	114.55
May-20	31.50	43.60	50.20	7.30	7.9	4.7	1.80	46.00	44.50	1.79	38.70	0.47	1.00	119.85
MEAN	29.80	41.27	51.10	7.04	7.75	4.60	1.75	41.80	40.55	1.75	34.25	0.38	0.85	115.02

IV. CONCLUSION

In the present study base line data concentration of all parameters are at nearly permissible limit at all the 4 stations. Hence the lake water is very well suitable for drinking, bathing, irrigation and fisheries purposes.

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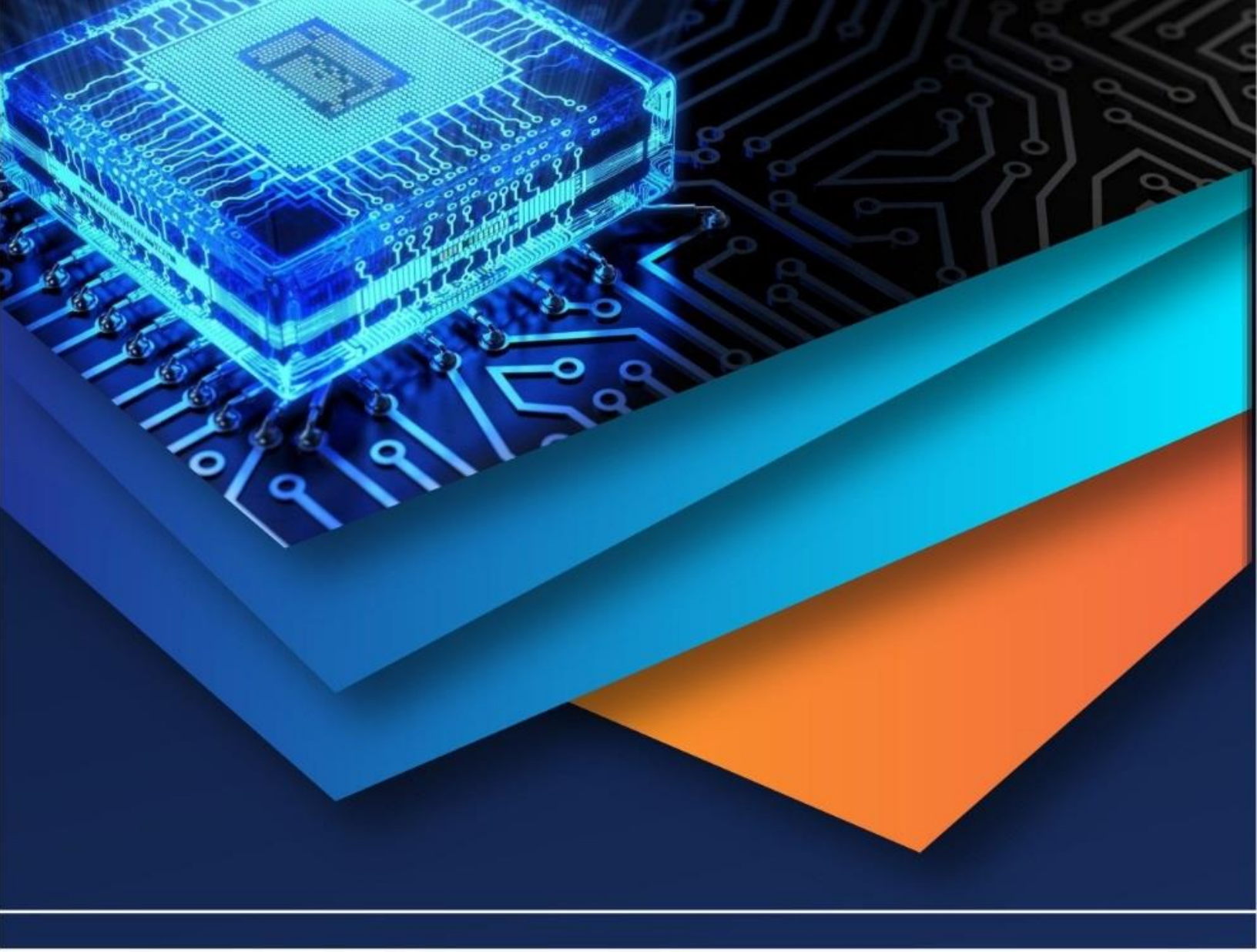

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